

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE APPLICATION OF  
CHANTRANUKUL, ET AL.

GROUP ART UNIT: 1615  
EXAMINER: SASAN, ARADHANA

SERIAL NUMBER: 10/791,478

FILED: 02 MARCH 2004

FOR: BLENDS OF DIFFERENT ACYL GELLAN GUMS AND STARCH

Commissioner of Patents and Trademarks

P.O. Box 1450

Alexandria, VA 22313-1450

**DECLARATION UNDER RULE 132 (37 C.F.R. §1.132)**

Sir:

I, Michele Shore, a citizen of the United States, currently residing at 960 N. Mountain Ave. in Bound Brook, NJ declare as follows.

I am familiar with the issues raised in this case.

I graduated from the State University of New York - College of Environmental Science and Forestry in 1995 with a MS Degree in Paper Science and Engineering. I have been employed by the Natural Polymer Group of National Starch and Chemical Company, now National Starch LLC, (NSC) since 1995.

Since 1995, I have worked in a variety of technical roles within the Natural Polymer Group. My work at NSC has been primarily in the field of starch, and I have contributed to new product developments in the areas of

papermaking, industrial specialties, nonwovens, clinical and infant nutrition and pharmaceutical excipients.

My current position is Senior Development Associate in the Delivery Systems Business of National Starch Food Innovation. My expertise is directed towards the research and development of new modified starch products which provide novel and unique functional benefits in target applications, such as in pharmaceutical dosage forms. A particular area of expertise is in the area of softgel capsules. To do this I have utilized my strong knowledge of traditional modified starch chemistries as well as explored the use of new and non-traditional starch sources in combination with both traditional and innovative chemistries in my research work. Overall, my work has given me a strong background in the development and use of novel starch bases and traditional modifications for a variety of applications and functionalities. I am the inventor of four U.S. patents or applications and numerous non-US patents and applications.

The experiments below were conducted under my supervision and guidance to demonstrate that films formed from Example 4 of Gilleland, et al. (US 6,375,981) cannot be machined using conventional equipment to form capsules and therefore differ from the formulations claimed in the present invention.

#### Materials

KELCOGEL®LT 100 (high acyl gellan gum available from C.P. Kelco, US)

KELCOGEL® F (low acyl gellan gum available from C.P. Kelco, US)

Sorbitol (70% solution available from Spectrum Chemical, USP grade)

Hydroxypropylated (3%) potato starch with a molecular weight of about 347,000 (available from Avebe, Netherlands).

Deionized water

### Samples

Sample 1 – formulation of Example 4 of Gilleland using potato starch and 100% high acyl gellan gum

Sample 2 – formulation of Example 4 of Gilleland using potato starch and 100% low acyl gellan gum

Sample 3 – formulation of Example 4 of Gilleland using potato starch and high acyl and low acyl gellan gums in a ratio of 13.8:1.

**Table 1 – Sample Compositions**

	Sample #1	Sample #2	Sample #3
Starch	29.69 g	29.69 g	29.69 g
High Acyl Gellan	4.28 g	-	3.99 g
Low Acyl Gellan	-	4.28 g	0.29 g
Sorbitol	55.39 g	55.39 g	55.39 g
Water	110.49 g	110.49 g	110.49 g

### Procedure

The methodology of Gilleland was used with the exception that the amount was scaled up to a total of 200 grams as shown in Table 1, above, in order to have enough material to make capsules. Further, the type of gellan gum was not specified so three samples were made, one with high acyl gellan gum, one with low acyl gellan gum, and one with a mixture of high and low acyl gellan gum in a ratio of 13.8:1 which is about midpoint if the presently claimed ratio of 0.25:1 to 30.0:1. Where insufficient information was given regarding procedure, I used the industry standard, which is practiced in our laboratory. For example, there are multiple ways of obtaining the molecular weight of natural polymers. The method by which the starch molecular weight is reported in Example 4 was not specified by Gilleland; therefore, molecular weights in these experiments were determined by GPC measurement and can be viewed as substantially equivalent to the

starch used in Example 4 based on standard variability involved with GPC measurements for natural polymers such as starch.

Gilleland did not form films into capsules. The following procedure, which is used in our laboratory and works with the formulations of the above-identified application, was used to form capsules from the Gilleland films. This procedure has proven repeatability and correlation to commercial capsule making results.

Wet films were cut into sections in order to make capsules on a manual laboratory capsule press. The press consists of two heated metal dies at 55°C that contain commercial-size capsule shapes. One film is placed on the bottom die and vacuum is applied to conform the film to the capsule half-shape. Vegetable oil is used as the capsule filing and is applied to the lower capsule impression. The second film is placed over the first film, and the second heated metal die is placed over the first metal die. Air pressure is applied to press the dies together and seal the films into capsules. Capsule sealability is a critical performance parameter that must be met in order for the finished capsules to survive the production and drying process. Sealability is reported as the percentage of capsules attempted that successfully seal.

Finished capsules are placed in small plastic bags and measured for burst strength on a Texture Analyzer. Burst strength is defined as the grams of force required to burst a sealed capsule.

## Results

As shown in Table 2 below, successful capsules requiring >2000 grams of burst strength and 100% sealability could not be produced from the teachings of Gilleland. With low acyl gellan (Sample 2), the wet film could not be removed from the casting plate until after 6 minutes and the films would not seal together to produce capsules. With high acyl, or, a blend of high and low acyl (Samples 1 and 3), the seal strength of the capsules was not sufficient which resulted in 20-

25% leakage. Additionally, the capsule strength was extremely low and would not be feasible for commercial capsule making using conventional methods. As taught by Gilleland, starches, and potato starches in particular, would not be processable into uniform films based on the viscosities and film uniformity observed in these experiments.

Observations	Sample #1	Sample #2	Sample #3
<b>Melt</b>	High viscosity; white/opaque	Ingredients did not blend well, Lower (thinner) viscosity, more transparent	High viscosity but lower than Sample 1
<b>Film</b>	Difficult to cast, gelled quickly, removed from plate at t=2 min	Gelled quickly but wet and could not be removed from plate until >t=6 min	Difficult to cast, gelled quickly, removed from plate at t=2 min
<b>Making Capsules</b>	82% sealability	Films did not seal	73% sealability
<b>Capsule Burst Strength</b>	Low burst at 205 g	No capsules	Low burst at 305 g

### Conclusions

Gilleland does not demonstrate that his films in 6,375,981 could produce capsules, particularly capsules with good film strength and sealability. From the results provided above, it can be seen that the formulations taught by Gilleland did not result in films that could survive conventional capsule making process. As can be seen from Sample 3 (closest to the present invention), the viscosity was too thick to successfully process in accordance with Gilleland and an increase in the molecular weight would further increase the viscosity. In contrast, the formulations of the above-identified application using a mixture of gellan

gums and the proper starch to plasticizer ratio form capsules with excellent film strength and sealability.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by a fine or imprisonment or both under 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed at Bridgewater, NJ this 8/7/08  
location date

Michele M Shore  
Michele Shore

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